CLAIMS:

1. A method of forming a roughened layer of platinum, comprising:

providing a substrate within a reaction chamber;

flowing an oxidizing gas into the reaction chamber;

flowing a platinum precursor into the reaction chamber and depositing platinum from the platinum precursor over the substrate in the presence of the oxidizing gas; and

maintaining a temperature within the reaction chamber at from about 0°C to less than 300°C during the depositing.

2. The method of claim 1 further comprising providing a reactant in contact with the roughened layer of platinum and utilizing the platinum to catalyze a conversion of the reactant to a product.

3. The method of claim 1 wherein the flowing the platinum precursor comprises flowing a carrier gas carrying the platinum precursor, the carrier gas being flowed at a rate of no greater than about 30 sccm and the oxidizing gas being flowed at a rate of at least about 50 sccm.

4. The method of claim 1 wherein the oxidizing gas comprises at least one of O_2, N_2O, SO_3, O_3, H_2O_2, or NO_x, wherein x has a value of from 1 to 3.

5. The method of claim 1 wherein the platinum precursor comprises at least one of $MeCpPtMe_3$, $CpPtMe_3$, Pt(acetylacetonate)$_2$, $Pt(PF_3)_4$, $Pt(CO)_2Cl_2$, cis-[$PtMe_2(MeNC)_2$], or platinum hexafluoroacetylacetonate.

6. The method of claim 1 wherein the maintaining comprises maintaining the temperature at from about 200°C to less than 300°C.

7. The method of claim 1 wherein the maintaining comprises maintaining the temperature at from about 220°C to about 280°C.

8. The method of claim 1 further comprising forming an adhesion layer over the substrate and depositing the platinum onto the adhesion layer.

9. The method of claim 8 wherein the adhesion layer comprises at least one of titanium nitride, iridium, rhodium, ruthenium, platinum, palladium, osmium, silver, rhodium/platinum alloy, IrO_2, RuO_2, RhO_2, or OsO_2.

10. The method of claim 1 further comprising flowing at least one other metal precursor into the chamber in addition to the platinum precursor, and wherein the platinum is deposited as an alloy of platinum and the at least one other metal.

11. The method of claim 1 further comprising flowing a second metal precursor into the chamber and wherein the platinum is deposited as an alloy of platinum and the second metal.

12. The method of claim 11 wherein the second metal is rhodium, iridium, ruthenium, palladium, osmium, or silver.

13. The method of claim 1 wherein the platinum is deposited to a thickness of at least about 400Å.

14. The method of claim 1 wherein the maintaining comprises maintaining the temperature at from about 200°C to less than 300°C, and wherein the platinum is deposited to a thickness of at least about 600Å in a time of less than about 40 seconds.

15. A method of forming a roughened layer of platinum, comprising:

providing a substrate within a reaction chamber;

flowing an oxidizing gas into the reaction chamber;

flowing a platinum precursor into the chamber and depositing platinum from the platinum precursor over the substrate in the presence of the oxidizing gas;

maintaining a temperature within the chamber at from about 0°C to less than or equal to about 280°C during the depositing, the deposited platinum having a rougher surface than it would have if the temperature were 300°C or greater during the depositing.

16. The method of claim 15 wherein the deposited platinum forms a continuous layer over a surface area that is at least 4 x 10^6 square Angstroms.

17. The method of claim 15 wherein the deposited platinum is hemispherical grain platinum.

18. A method of forming a capacitor, comprising:

providing a substrate within a reaction chamber;

flowing a first oxidizing gas into the reaction chamber;

flowing a first platinum precursor into the chamber and depositing platinum from the first platinum precursor over the substrate in the presence of the first oxidizing gas while maintaining a temperature within the chamber at from about 0°C to less than 300°C, and providing the deposited platinum into a first capacitor electrode;

forming a second capacitor electrode proximate the first capacitor electrode; and

forming a dielectric layer proximate the first capacitor electrode, the dielectric layer being between the first and second capacitor electrodes.

19. The method of claim 18 wherein the flowing' the first platinum precursor comprises flowing a carrier gas carrying the platinum precursor, the carrier gas being flowed at a rate no greater than 30 sccm and the first oxidizing gas being flowed at a rate of at least 50 sccm.

20. The method of claim 18 wherein the forming the second capacitor electrode comprises depositing platinum from a second platinum precursor in the presence of a second oxidizing gas.

21. The method of claim 20 wherein the second platinum precursor is the same as the first platinum precursor.

22. The method of claim 20 wherein the second oxidizing gas is the same as the first oxidizing gas.

23. The method of claim 20 further comprising flowing a second metal precursor into the chamber with the first platinum precursor, and wherein the platinum is deposited as an alloy of platinum and the second metal.

24. The method of claim 23 wherein the second metal is rhodium, iridium, ruthenium, palladium, osmium, or silver.

25. The method of claim 18 further comprising forming an adhesion layer over the substrate and depositing the platinum onto the adhesion layer.

26. The method of claim 25 wherein the adhesion layer comprises at least one of titanium nitride, iridium, rhodium, ruthenium, platinum, palladium, osmium, silver, rhodium/platinum alloy, IrO_2, RuO_2, RhO_2, or OsO_2.

27. The method of claim 18 wherein the maintaining comprises maintaining the temperature at from about 200°C to less than 300°C.

28. The method of claim 18 wherein the maintaining comprises maintaining the temperature at from about 220°C to about 280°C.

29. A circuit comprising:

a semiconductive substrate; and

a roughened platinum layer over the substrate, the roughened platinum layer comprising hemispherical grain platinum.

30. A circuit comprising:

a semiconductive substrate; and

a roughened platinum layer over the substrate, the roughened platinum layer being continuous over an area of the substrate that comprises at least about 4×10^6 square Angstroms and comprising pedestals that are at least about 300Å tall within the area.

31. The circuit of claim 30 wherein the platinum layer comprises hemispherical grain platinum.

32. The circuit of claim 30 wherein the area of the substrate comprises a square.

33. A circuit comprising:

a semiconductive substrate; and

a roughened platinum layer over the substrate, the roughened platinum layer having a continuous surface characterized by columnar pedestals having heights greater than or equal to about one-third of a total thickness of the platinum layer.

34. The circuit of claim 33 wherein the platinum layer has a thickness of at least about 600Å.

35. The circuit of claim 33 wherein the platinum layer has a thickness of greater than or equal to about 400Å.

36. The circuit of claim 33 wherein the platinum layer has a thickness of greater than or equal to about 100Å.

37. The circuit of claim 33 further comprising an adhesion layer between the platinum layer and the substrate, the adhesion layer comprising at least one of titanium nitride, iridium, rhodium, ruthenium, platinum, palladium, osmium, silver, rhodium/platinum alloy, IrO_2, RuO_2, RhO_2, or OsO_2.

38. The circuit of claim 33 wherein the pedestals terminate in dome-shaped tops.

39. The circuit of claim 33 wherein the pedestals terminate in hemispherical tops.

40. A capacitor comprising:

a first capacitor electrode;

a second capacitor electrode;

a dielectric layer between the first and second capacitor electrodes; and

wherein at least one of the first and second capacitor electrodes comprises a roughened platinum layer, the roughened platinum layer having a thickness of from about 400Å to about 1000Å and comprising pedestals that are at least about 300Å tall.

41. The capacitor of claim 40 wherein the roughened platinum layer comprises hemispherical grain platinum.

42. The capacitor of claim 40 wherein the roughened platinum layer is over a surface and is continuous over an area of the surface that is at least about 4×10^6 square Angstroms.

43. The capacitor of claim 42 wherein the area comprises a square.

44. A capacitor comprising:

a first capacitor electrode;

a second capacitor electrode;

a dielectric layer between the first and second capacitor electrodes; and

wherein at least one of the first and second capacitor electrodes comprises a roughened platinum layer, the roughened platinum layer having a continuous surface characterized by columnar pedestals having heights greater than or equal to about one-third of a total thickness of the platinum layer.

45. The capacitor of claim 44 wherein both capacitor electrodes comprise platinum, but only one of the capacitor electrodes comprises the roughened platinum layer.

46. The capacitor of claim 44 wherein both capacitor electrodes comprise roughened platinum layers.

47. The circuit of claim 44 wherein the pedestals terminate in dome-shaped tops.

48. The circuit of claim 44 wherein the pedestals terminate in hemispherical tops.

49. A platinum-containing material, comprising:

a substrate; and

a roughened platinum layer over the substrate, the roughened platinum layer having a continuous surface characterized by columnar pedestals having heights greater than or equal to about one-third of a total thickness of the platinum layer.

50. The material of claim 49 wherein the pedestals terminate in dome-shaped tops.

51. The material of claim 49 wherein the pedestals terminate in hemispherical tops.

52. A reaction catalyst comprising hemispherical grain platinum.

53. A reaction catalyst characterized by an outer surface portion of platinum comprising a plurality of columnar pedestals that are at least about 100Å tall.

54. The catalyst of claim 53 wherein the columnar pedestals are at least about 400Å tall.

55. The catalyst of claim 53 wherein the platinum comprises hemispherical grain platinum.

56. The catalyst of claim 53 wherein the surface portion is continuous over a substrate and covers an area of the substrate that is at least about 4 x 10^6 square Angstroms.